Guidelines for the Management of Community-Acquired Methicillin-Resistant *Staphylococcus aureus* (CA-MRSA) Infections in the US Navy and Marine Corps

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PURPOSE

These guidelines provide recommendations for the prevention, treatment, and containment of CA-MRSA infections in Navy and Marine Corps personnel. Particular attention is given to the prevention and management of CA-MRSA outbreaks within military operational units and training facilities.

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EXECUTIVE SUMMARY

Community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA) occurs in healthy persons who do not have traditional MRSA associated risk factors: history of recent hospitalization or surgery, recent antibiotic usage, injection drug use or long-term inpatient care. Outbreaks of cellulitis, abscesses, and other skin and soft tissue infections (SSTIs) caused by CA-MRSA have been reported in prison inmates, players of contact sports, military members and children in daycare. Navy and Marine Corps service members are similarly at risk from this emerging pathogen. Since 2001, outbreaks have been identified on several surface ships, submarines and aircraft carriers, Marine Corps Recruit Depot-Parris Island, Basic Underwater Demolition School and the Naval Aviation Training Center in Pensacola.

It is estimated that 2-3% of the general population are now colonized with MRSA, and populations that live in communal situations (e.g., military and prisons) have a 5% colonization rate. Colonized persons are more likely to develop infections, although most remain asymptomatic.

Primarily transmitted person to person through direct contact, MRSA is most often spread from the hands of an infected or colonized individual. The sharing of clothing, personal hygiene items or training equipment may also transmit MRSA. In the military, prolonged close person-to-person contact and lapses in personal hygiene create ideal conditions for MRSA transmission.

Recommendations:

1. Diagnosis: When to consider MRSA infection
   a. Consider MRSA infection in the differential diagnosis for all individuals presenting with SSTIs or other clinical presentations consistent with staphylococcal infection.
   b. Culture ALL infections having open lesions, drainage, or abscesses. Do not obtain cultures from intact skin surfaces, even if cellulitis is present.
   c. Evaluation of SSTIs should include assessment of the lesion and evaluation of the patient's risk factors for MRSA.
   d. An empiric diagnosis of a MRSA infection should be considered in individuals with clinical evidence of a staphylococcal infection AND associated risk factors. In these cases, empiric treatment with an antibiotic effective against CA-MRSA is an option.

2. Reporting: Notify public health authorities of MRSA cases and outbreaks
   a. Document all confirmed MRSA infections in the person's medical record. Include culture results as well as treatment regimen and time course.
   b. Commands are encouraged to track MRSA cases locally and contact the NEPMU as necessary for assistance.
   c. All suspected or confirmed MRSA outbreaks or clusters should be reported to the local military medical treatment facility preventive medicine office, the responsible Navy Environmental and Preventive Medicine Unit (NEPMU), and to civilian public health authorities as required.

3. Treatment: Antimicrobial sensitivities should guide choice of antibiotics
   a. Local treatment (hot packs, rest, elevation) and incision and drainage (I&D) remain the first-line therapies for skin infections. Mild infections may be treated with I&D and local treatment alone.
   b. Moderate or severe infections may require antibiotic treatment. If antibiotics are to be used, empirically treat with dicloxacillin or a first-generation cephalosporin. For areas that have a high prevalence of CA-MRSA (i.e., greater than 30% of all SSTIs), or for patients presenting as part of an outbreak, empirically treat with the following antibiotics or another regimen effective against CA-MRSA (see 3d).
      i. TMP-SMX 160 mg/800 mg bid for 10-14 days.
      ii. Doxycycline/minocycline 100 mg bid for 10-14 days.
      iii. Fluoroquinolones and clindamycin are contraindicated as empiric therapy.
   c. Re-evaluate the patient within 24-48 hours to assess the wound and culture results. Antibiotics should then be changed based on laboratory confirmation of MRSA infection and antibiotic sensitivities.
   d. For confirmed cases of MRSA that need antibiotic therapy, use (in order of preference):
      i. Trimethoprim/sulfamethoxazole (TMP-SMX) 160 mg/800 mg bid for 10-14 days.
      ii. Doxycycline/minocycline 100 mg bid for 10-14 days.
      iii. Clindamycin 150 mg qid for 10-14 days. Prior to use, consult your laboratory for D testing to determine if inducible resistance is present for clindamycin.
   e. For cases presenting as part of an outbreak, or in patients with recurrent skin infections, mupirocin 2% nasal ointment should be applied twice a day for 10 days, and Hibiclens® washings to cover the body from the neck down daily for 5 days. Consider this step in any patient from a high-risk setting (e.g., recruits, shipboard personnel).

4. Primary Prevention: Avoiding the spread of MRSA at your command or facility
   a. Education: Provide information to personnel on the transmission of CA-MRSA infections and the importance of frequent handwashing, particularly in the recruit and training settings.
   b. Raise awareness among officer and senior enlisted personnel of the risks of infections due to high-density living environments. Instructors and other senior staff should receive training on the recognition of potentially infected wounds.
   c. Maintain and enforce good hygiene.
      i. Recruits and training staff should be periodically provided education on the importance of hand hygiene and effective hand hygiene techniques.
      ii. Implement a program of required and frequent hand washing: all personnel should wash their hands with soap and running water a minimum of 5 times per day, including before meals and after toileting. Hands should be washed for at least 15 seconds. Consider issuing alcohol-based hand sanitizer.
      iii. Enforce a regimen of daily showers, emphasizing adequate duration and use of soap.
      iv. Prohibit sharing of any personal hygiene items (e.g., towels, razors, etc.)
   d. Encourage trainees, recruits and other service members to report all skin lesions to supervisors or medical personnel.
   e. Establish a routine cleaning schedule of barracks spaces, heads, and athletic and training equipment. This cleaning must be done at least once a week with a 1:10 bleach solution. Helmets, protective gear, and weight benches should be wiped clean after use with a clean dry towel.

5. Secondary Prevention: Containing MRSA
   a. Individuals with CA-MRSA infections should be counseled on the importance of handwashing, good personal hygiene, and keeping the infection site covered.
   b. Interview the index case to identify potential sources of infection and close contacts, including recent hospitalizations, berthing and work assignments, sharing of personal hygiene items with other recruits or shipmates, injection drug use, tattooing, participation in contact sports, and exposure to other members with draining wounds or skin infections.
   c. In operational or recruit settings with close contact between personnel and a high likelihood of transmission, it may be advisable to screen individuals for colonization via cultures of the anterior nares. In these instances, consult with preventive medicine personnel and screen only those individuals that have had significant direct physical contact with the index case (e.g., squad members, sports teammates, household members, bunkmates, members who sleep in adjacent cots or share equipment or clothing with the index case).
   d. To eradicate colonization in asymptomatic individuals, consult with NEPMU on use of mupirocin and Hibiclens®. For large outbreaks, decolonization may also include oral antibiotics (3.d).

6. Outbreak Control: Keeping things from getting out of hand
   a. Notify the local preventive medicine office and the responsible NEPMU.
   b. Establish a clear case definition of CA-MRSA infection: Any skin or soft tissue infection with a culture positive for MRSA from the site of infection. Infections in individuals who have a MRSA positive nasal culture, without a positive wound culture, are not considered CA-MRSA infections.
   c. Consider use of an antiseptic washing (Hibiclens®) for exposed personnel either as a single event or at periodic intervals (i.e., upon reporting, after a field evolution, daily, etc.).
   d. Reinforce hygiene measures including observed showers in the recruit/training setting.
   e. Focal groups (e.g., members of one particular class, berthing, or platoon) that have been heavily affected with MRSA cases (more than 5% of members infected) should receive additional training on the importance of personal hygiene in preventing spread of MRSA and wound care. Further, use of an antiseptic wash (e.g., Hibiclens®) for all members of this group (both those infected and asymptomatic) should be considered. Frequent (weekly) whole-body screenings to check for SSTIs may be indicated.
   f. Clean medical spaces, barracks rooms, heads, and common areas with a one to ten (1:10) bleach solution.
   g. Encourage providers to maintain a high index of suspicion for CA-MRSA. Consider empiric treatment with a regimen effective against CA-MRSA.
   h. Demographic information for individuals with positive cultures (e.g., date, location, etc.) should be collected and forwarded to Preventive Medicine personnel in a timely manner (e.g., weekly).

1. INTRODUCTION

Staphylococcal bacteria are one of the most common causes of skin infections in the United States. Most of these infections are minor (such as carbuncles and furuncles) and are treated easily without medication or with commonly used antibiotics.[1] However, *Staphylococcus aureus* can also cause serious infections such as surgical wound infections, pneumonia, sepsis, and even death.[1,2] In the past, most serious staphylococcal infections were treated with the beta-lactam class of antibiotics. Over the past 50 years, treatment of these infections has become more difficult because staphylococcus strains have become resistant to commonly prescribed beta-lactam antibiotics (penicillins and cephalosporins).[3-8] These resistant bacteria are called methicillin-resistant *Staphylococcus aureus,* or MRSA.

Since its recognition in the 1960's, MRSA has become a well-known source of infection in hospitals and healthcare facilities. Recently, however, MRSA has been reported with increasing frequency as a community-acquired infection.[4] Outbreaks of community-acquired MRSA (CA-MRSA) have been reported in a variety of non-hospital related populations throughout the United States including prison inmates, players of contact sports, military members, children in daycare, and men who have sex with men.[3-9] MRSA has traditionally affected persons with particular risk factors such as history of recent hospitalization, prior antibiotic usage, injection drug use, or long-term inpatient care.[4,10] However, the recent outbreaks of CA-MRSA often occur in otherwise healthy persons without the traditional risk factors.[4,6,10-12]

The relatively healthy population of the US military has been equally affected by CA-MRSA infections. In some cases, CA-MRSA has resulted in outbreaks that have been costly and difficult to control and have had potential impact on mission readiness. Since 2001, CA-MRSA outbreaks have occurred on surface ships,[7] aircraft carriers, submarines, at Marine Corps Recruit Depot Parris Island,[13] Basic Underwater Demolition School and Naval Aviation Training Command in Pensacola.

Individuals with MRSA skin infections commonly complain of "an infected pimple," "an insect bite," "a spider bite," or "a sore". Many MRSA infections cause minor inflammation without pain and infected sailors and Marines may be able to initially continue their duties without interruption and therefore, may not seek medical attention. These problems are further impacted in the recruit or deployed setting, where insect bites and minor cuts or abrasions occur routinely, thus predisposing the skin to invasion by organisms.[13] More serious MRSA infections such as cellulitis, deep-seated abscesses, septic arthritis, pneumonia, and sepsis may occur in otherwise healthy individuals.[1,7,11] Persons with complicating medical conditions such as diabetes, HIV infection, chronic skin conditions, indwelling catheters, post-surgical wounds, and decubiti are at increased risk of serious MRSA infections.[14,15]

2. COLONIZATION

An estimated 10-40% of persons are colonized with *Staphylococcus aureus* in their nares, mucous membranes, or breaks in their skin.[1,4,16] A small subset of these persons are colonized with MRSA. As there is no nationwide, systematic community surveillance of MRSA isolates, the actual prevalence of MRSA colonization is unknown.[4] However, several recent studies on this topic have found prevalence rates ranging from 1-5%.[7,17-19]

Two studies conducted in 2003 among healthy outpatients have found prevalence rates between 2-3%.[17,18] A 2002 meta-analysis pooled 9 studies of CA-MRSA (total of 4825 patients) and

found a prevalence rate of 2.1%.[20] In a separate study among patients with no risk factors (n=3525) the prevalence fell to 1.2%. A colonization survey conducted in Marine Corps recruits (n=790) found that 3-5% of recruits were colonized with MRSA at the start of basic training (unpublished data, Navy Environmental and Preventive Medicine Unit No. 2). The Centers for Disease Control and Prevention (CDC) are currently collaborating with state and local health departments to conduct active, population-based surveillance in selected regions of the United States.

Although colonized persons are more likely to develop staphylococcal infections, many colonized individuals remain asymptomatic. Staphylococcal colonization occurs more commonly in injection drug users, individuals with type 1 diabetes, hemodialysis patients, persons with acquired immunodeficiency syndrome (AIDS), surgical patients, and previously hospitalized patients, due in part to their greater exposure to microbial agents in the healthcare setting and compromised immune systems.[1,4,11]

3. TRANSMISSION

MRSA is primarily transmitted from person to person by direct contact, usually from the hands of an infected or colonized individual.[11] It can also be transmitted by sharing towels, personal hygiene items, athletic equipment, clothes, drug use equipment, contact sports, or food-borne outbreaks.[5-7,21] Persons with pneumonia in close contact with others can transmit MRSA by coughing up large droplets of infectious particles.[14] Military conditions often involve prolonged close contact between individuals. These close contact situations, combined with lapses in personal hygiene (particularly in the recruit and deployed settings) are an ideal environment for CA-MRSA transmission.

Outbreaks of CA-MRSA in civilian prisons have been linked to poor hygiene, sharing of contaminated personal items and participation in unsanitary tattooing practices. However, the source of MRSA infections and the mode of transmission are not readily apparent even after thorough epidemiologic investigations.[3,11,14,16] The opportunity for MRSA to spread in a prison setting is similar to that in recruit settings: recruits have frequent close contact with each other and may not perform adequate personal hygiene during their rigorous training schedule. Investigations of CA-MRSA outbreaks have found that some affected individuals share personal items such as razors and towels, and may not shower adequately or wash their hands regularly.[3,6,9,13,16] Further, military members may often suffer cuts or abrasions in the course of their normal duties similar to clusters that have occurred among competitive sports participants.[6,13] These breaks in the skin facilitate the entry of pathogens. Finally, operational tasks often involve the wearing of protective equipment that may be shared between service members. The sharing of training or protective equipment, and/or exposure to surfaces which have been in contact with moist or sweaty skin (e.g., gym mats), can facilitate the spread of organisms from one individual to another.[5,6]

4. DIAGNOSIS

An overall strategy for evaluating and treating CA-MRSA infections is outlined in Appendix 1: Evaluation and Treatment of Skin and Soft Tissue Infections in the Military Setting.

A. Prevalence of CA-MRSA

Healthcare providers should consider MRSA infection in the differential diagnosis for all Sailors

and Marines presenting with skin and soft tissue infections (SSTIs) or other symptom manifestations consistent with a staphylococcal infection. The proportion of community-acquired staphylococcal skin infections that are methicillin-resistant is significant and likely on the rise.[19,22] A 1997 study in an outpatient dermatology clinic population showed that the percent of all *S. aureus* isolates that were methicillin-resistant rose from 2% in 1988 to 11% in 1996.[19] Preliminary data has shown that the proportion of all SSTIs caused by CA-MRSA at some Navy medical facilities in the Southeast US may be as high as 30-40%.[23] A study among inmates in California prisons from 1997 to 2000 found that 54% of all staphylococcal isolates were MRSA.[16] Further, MRSA is not uncommon within military units and vessels; cases have been reported from several surface ships and aircraft carriers, submarines, Navy Training Center Great Lakes, both USMC recruit depots, BUDs School, and various other operational units and training commands. Therefore, any service member presenting with a skin infection that is consistent with *S. aureus* should be evaluated for the possibility of methicillin-resistance.

Note that during an outbreak situation, the prevalence of CA-MRSA colonization may be higher than the 2-3% found in the general population.[17,18] For example, the prevalence of colonization during an outbreak in 2000 in a state prison was 5% and during an outbreak on a US Navy surface ship in 2001 the prevalence in close contacts was 6%.[7,11] These data further suggest that culturing of all skin infections is necessary to document antibiotic sensitivity trends in any setting where a CA-MRSA outbreak is ongoing.

B. Evaluation of individuals presenting with skin lesions

Evaluation of SSTIs should include:

1. Assessment of the lesion— During CA-MRSA outbreaks occurring in civilian prisons and military recruits, many infections were initially described and diagnosed as “insect” or “spider bites”.[3]

2. Identifying risk factors for MRSA— Patients presenting with a skin or soft tissue infection should be questioned regarding their possible risk factors for MRSA infection as outlined in Table 1.[4,7,10,11,23]

3. Performing and reviewing laboratory cultures[14]— Aerobic bacterial cultures should be obtained routinely whenever possible since, 1) SSTIs caused by methicillin-resistant or methicillin-sensitive *S. aureus* (MSSA) strains cannot be distinguished by clinical presentation, and 2) identification of the species and antibiotic sensitivities of the organism will guide the choice of antibiotic therapy. Cultures should be obtained on all draining wounds, aspirated pus from soft tissue infections, and aspirated fluid from potentially infected fluid collections. Blood cultures should also be obtained in febrile patients with suspected MRSA infections and whenever injection drug use or endocarditis is clinically suspected.

   Positive cultures from blood and sterile body fluids (e.g., joint fluid, pleural fluid, cerebrospinal fluid) are diagnostic of MRSA infections. Positive cultures from non-sterile sites (e.g., wound drainage, open sores) may indicate bacterial infection or colonization and must be interpreted in the context of the patient’s clinical presentation.

Table 1: Risk Factors for MRSA

Community-Acquired or Military Risk Factors

- Crowded living conditions (prisons, military facilities, homeless shelters)
- Certain populations (Pacific Islanders, Alaskan Natives, Native Americans)
- Contact sports (football, rugby, wrestling)
- Men who have sex with men
- Sharing of towels, athletic equipment, personal items
- Poor personal hygiene

Hospital-Acquired or Traditional Risk Factors

- Recent hospitalization (within 1 year)
- Recent surgery (inpatient or outpatient, within 1 year)
- History of recurrent abscesses, folliculitis, furunculosis or other skin infections
- History of recurrent skin infections in a close contact or household member
- Laboratory confirmed case of MRSA in a close contact or household member
- Long-term care facility residence or repeated contact with residents
- Intravenous drug use
- Indwelling catheters
- Medical conditions (e.g., diabetes, HIV, renal failure)

C. Assessment of colonization

Assessing for MRSA colonization by obtaining bacterial cultures of the nares is not routinely indicated, unless recommended by local preventive medicine personnel or the responsible Navy Environmental Preventive Medicine Unit (NEPMU) staff. Generally, this is conducted in the context of a significant MRSA outbreak or as part of a surveillance program. It may be advisable to screen for colonization in operational or recruit settings in those with close contact between personnel and a high likelihood of transmission. In these instances, consult with preventive medicine staff and screen only those contacts that would have significant daily exposure or direct physical contact with the case (e.g., squadmates, sports teammates, bunkmates, household members, persons who sleep in adjacent bunks, or share equipment or clothing with the index case).

If nasal screening is conducted, cultures should be obtained using the following protocol:

1. Remove swab collection device from its packaging material.
2. Confirm that swab collection device has been pre-labeled with appropriate identifiers.
3. Moisten swab with sterile saline.
4. Insert pre-moistened swab approximately 2 cm into one nares.
5. Rotate the swab against the anterior nasal mucosa for 3 seconds.
6. Using the same swab, repeat for the other nares.
7. Return swab to transport sleeve.
8. Ship specimens to the laboratory as soon as possible. Specimens should be stored for no more than 3-4 days at 4°-8°C before shipping. Follow manufacturer's specific recommendations for culture collection and transport.

5. REPORTING

All confirmed MRSA infections must be recorded in the individual's medical record, including culture results and treatment regimen.

Although it is not required to report each individual MRSA case to the responsible NEPMU, commands are encouraged to track MRSA locally and contact the NEPMU as necessary for assistance. Note that some states and local health jurisdictions require that all MRSA cases be reported to the local health department.

All suspected or confirmed MRSA outbreaks are required to be reported to the local military medical treatment facility (MTF) preventive medicine office and the responsible NEPMU in accordance with BUMED INSTR 6220.12A and to civilian public health authorities in accordance with local laws. The Naval Disease Reporting System (NDRS) is the preferred method of reporting for the Navy but phone and fax are acceptable alternatives. As noted in the instruction, a reportable outbreak is defined as "a communicable condition with a suspected common source, or which occurs in one or more clusters among personnel in a particular location, work center, berthing compartment, day care, or involving more than an expected number of individuals." Thus, a MRSA cluster may be defined as two or more epidemiologically-related, culture-positive cases.

6. TREATMENT

A. Local treatment and drainage

Community-acquired MRSA infections often present as limited skin or soft tissue infections such as furuncles or small abscesses. A careful examination of skin infections should be conducted to determine if there is fluctuance or other evidence of a drainable infection. Although data specifically on CA-MRSA infection is lacking, local treatment (hot packs) and I&D remain the first-line therapies for skin infections.[7,11,24] Aggressive drainage is the most important treatment for abscesses, accessible fluid collections, and particularly loculated soft tissue infections. A 2004 study among 69 children with CA-MRSA in Dallas, Texas found that I&D (and not antibiotic use) was the only measure proven effective in resolving patients' infections.[25] Infections requiring drainage should be frequently reassessed (e.g., every 24-48 hours) to determine if repeated drainage is warranted. Catheters and other foreign devices related to the infection should be removed whenever possible. Mild skin infections such as carbuncles and furuncles may resolve with drainage and hot packs alone without necessitating the use of antibiotics.[24]

B. Antibiotic therapy

1. Empiric antibiotic therapy

If there is a low likelihood of MRSA (e.g., no outbreak setting, minimal risk factors), the initial treatment of SSTIs remains unchanged. If an antibiotic is to be used, empirically treat with a first-generation cephalosporin or dicloxacillin.[24] The patient should be re-evaluated within 24-48 hours to assess the wound and culture results. Antibiotics should then be changed based on laboratory confirmation of MRSA infection and antibiotic sensitivities.

Community-acquired MRSA infections are almost universally sensitive to a wider range of antibiotics than typical hospital-acquired MRSA infections. In general, hospital-acquired infections are sensitive only to vancomycin and resistant to most commonly used regimens.[4] While resistant to the beta-lactams, CA-MRSA is often sensitive to most other commonly used antibiotics such as TMP-SMX, doxycycline/minocycline, rifampin, and in some cases, erythromycin and clindamycin.[4,16,23]

Empiric treatment for CA-MRSA for a patient presenting with a SSTI may be considered when there is a high clinical suspicion: multiple MRSA risk factors, failure to respond to antibiotic therapy, or in the setting of an outbreak within a unit or recruit facility. In the context of a CA-MRSA outbreak, the percentage of all SSTIs that are due to CA-MRSA may be high enough to warrant empiric therapy with a CA-MRSA-effective regimen. Initial empiric treatment for CA-MRSA (i.e., use of an antibiotic prior to laboratory confirmation of MRSA) should be considered for moderate or serious infections if the individual presents with associated risk factors. Selection of empiric antibiotics should be based on local patterns of susceptibility and local MTF antibiograms should be utilized accordingly. Empiric treatment with TMP-SMX or doxycycline/ minocycline may be advisable in deployed or remote settings where cultures or antibiograms are not available.

NOTE: SSTIs suggestive of staphylococcal infections that cannot be cultured (e.g., intact cellulitis) or have non-diagnostic culture results should be evaluated and treated on a case-by-case basis.

2. Antibiotic therapy for confirmed CA-MRSA infections

Although CA-MRSA infections are generally susceptible to many antibiotics, the optimal treatment regimen is unknown due to a lack of published data and the potential that *in vitro* antibiotic susceptibilities may not correlate with the *in vivo* (i.e., clinical) response. However, the best available evidence from recent CA-MRSA outbreaks can be used to make recommendations for outpatient treatment. In a recent study of CA-MRSA infections occurring in California prisons between 1997 and 2002, the sensitivity patterns of 151 CA-MRSA isolates were reviewed.[16] Less than 1% of isolates were resistant to rifampin and 3% were resistant to TMP-SMX. A much higher proportion of isolates were resistant to clindamycin (6%) and ciprofloxacin (23%). A study of 354 CA-MRSA isolates cultured between 1996 and 1998 from 10 different hospital facilities in Minnesota found similar resistance patterns: no isolates were resistant to rifampin, 3% were resistant to TMP-SMZ, 6% were resistant to clindamycin and 11% were resistant to ciprofloxacin.[10] Finally, a 1998 study in Chicago found that as many as 60% of CA-MRSA isolates were resistant to ciprofloxacin.[26]

The preferred CA-MRSA treatment regimen is an antimicrobial with demonstrated effectiveness against CA-MRSA (see Table 2 below). Limited clinical experience from recent CA-MRSA outbreaks suggests cases can be treated with oral TMP-SMX or doxycycline/minocycline alone (monotherapy).[14] Each of these antibiotics has its own advantages and disadvantages as a therapeutic choice as outlined in Appendix 2: Oral Antibiotic Treatment Options for Skin and Soft Tissue CA-MRSA Infections.

NOTE: Rifampin as monotherapy is always ineffective against CA-MRSA due to the rapid development of resistance, regardless of *in vitro* laboratory susceptibility results, so advise against empiric treatment with antibiotics (e.g., clindamycin) without confirmation of sensitivities.

Although, dual antimicrobial therapy has been shown to ensure cure of the infection and decrease the risk of evolving further drug resistance in the organism, there are associated risks. The use of rifampin, the most common adjunctive therapy, can result in drug resistance in Mycobacteria and other non-staphylococcal organisms, potentially life-threatening toxicity (e.g., Stevens-Johnson Syndrome, hemolysis, hepatitis) and drug

interactions (e.g., oral contraceptives) which preclude its recommendation. Rifampin may be considered if the SSTI is deep or does not resolve, but only after consultation with NEPMU or MTF staff.

Table 2: Recommended treatment regimens for CA-MRSA infections

Choose one of the following:	Consider adding the following:
TMP-SMX (160mg/800mg) twice daily for 10-14 days --- OR --- **Doxycycline/Minocycline** 100 mg twice a day for 10-14 days --- OR --- **Clindamycin** 150 mg four times daily for 10-14 days	**+/- Chlorhexidine wash** once daily for 5 days --- PLUS --- **+/- Mupirocin** twice daily for 10 days

Because of the increased prevalence of resistance and the inducibility of resistance during monotherapy, fluoroquinolones are not empirically recommended for the treatment of MRSA. Use only in conjunction with other medications (e.g., rifampin) and only after documentation of sensitivity. Similarly, clindamycin has increasing prevalence of resistance and concerns about inducible resistance, which prevents it from being recommended for the treatment of MRSA without confirmation that the isolate is sensitive. Despite initial antibiotic sensitivity profiles which suggest clindamycin susceptibility, strains that are erythromycin-resistant are known to confer inducible resistance to clindamycin. Some published studies estimate that 45% of staphylococcal isolates have inducible resistance. Prior to prescribing clindamycin, confirm with the microbiology laboratory that the D test is negative (see Glossary for more detail).

The duration of antibiotic therapy for CA-MRSA SSTIs depends on the severity of the infection, the exact site of infection, and the clinical response to therapy. If antibiotics are required, treatment for a minimum of 10 days is indicated. Individuals with skin infections should be examined periodically during therapy to determine if drainage of the infection is warranted and to ensure that the infection is resolving. Once antibiotic therapy is discontinued the patient should be re-evaluated in one to two weeks to ensure that lesions have neither recently developed nor recurred.

3. Recurrent or persistent infections

Recurrent or persistent SSTIs during or immediately following antibiotic therapy may indicate either patient non-adherence to the prescribed treatment regimen, the development of antibiotic resistance or reexposure to CA-MRSA.

Trainees and recruits with recurrent or persistent skin lesions should be evaluated on a case-by-case basis to assess the most likely cause and to determine the appropriate intervention. Any current or future lesions should be cultured and empiric treatment with a regimen effective against CA-MRSA should be considered. In some cases, patients will require a suppressive regimen of doxycycline/minocycline for 3-6 months to prevent recurrence.

4. Treatment of hospital-acquired or serious MRSA infections

Initial antibiotic treatment with vancomycin generally is not indicated for inpatients with cellulitis or abscesses. Cellulitis can be caused by *Streptococcus* and other *Staphylococcus* species so begin treatment with appropriate beta-lactam antibiotic coverage and monitor the patient for improvement. Antibiotics such as nafcillin or cefazolin (Ancef®) are better than vancomycin for treating methicillin-sensitive *Staphylococcus aureus* (MSSA).[24] Depending on current MRSA prevalence, severity of infection, etc. the physician may choose vancomycin as initial treatment pending culture and antibiotic sensitivity results. If the *Staphylococcus* species is sensitive to beta-lactams, promptly switch from vancomycin to another antibiotic.

For SSTIs that are associated with clinical evidence of sepsis, fasciitis, toxic shock syndrome, or a progressing SSTI despite oral antibiotic treatment, strongly consider empiric therapy with IV vancomycin plus other antibiotics as warranted. Endocarditis and other endovascular infections, osteomyelitis, and certain other deep-seated infections usually require treatment with IV vancomycin for an extended period of time, usually 4-6 weeks or more. A second or third antibiotic may also be indicated in combination with vancomycin for certain MRSA infections (e.g., prosthetic valve endocarditis). Consultation with a physician expert is recommended for serious MRSA infections.

Unlike CA-MRSA, hospital-acquired MRSA infections are usually highly-resistant to most oral antibiotics and require intravenous vancomycin therapy. (NOTE: Oral vancomycin is poorly absorbed and should never be prescribed to treat MRSA infections.) Linezolid is a newly available oral and intravenous antibiotic that may be an alternative to vancomycin or allow earlier hospital discharge on an oral antibiotic regimen.[27,28] Another option for the treatment of serious SSTIs caused by MRSA is daptomycin, representing a new class of antibiotics with a unique mechanism of action. Treatment efficacy and drug toxicity data using linezolid and daptomycin for serious MRSA infections are limited. Therefore, these antibiotics should only be considered in consultation with a physician expert. Possible antibiotic regimens for serious MRSA infections requiring hospitalization are outlined in Appendix 3: Antibiotic Treatment Options for Serious MRSA Infections.

C. Decolonization following treatment

Decolonization with mupirocin is recommended for individuals with recurrent MRSA infections (i.e., 3 or more infections in less than 6 months). Mupirocin treatment helps to ensure eradication of nasal carriage of *Staphylococcus aureus* and thus limit further spread and/or self-inoculation.

However, the efficacy and permanence of this regimen is of limited benefit for long-term eradication. Mupirocin treatment does not eradicate colonization in all treated persons, does not prevent re-colonization following future exposures to MRSA, and when used broadly can result in mupirocin-resistant MRSA strains. A 1998 study among VA patients in a long-term care facility found that 40% of patients had recurrences of MRSA despite weekly maintenance with mupirocin.[31] Further, mupirocin-resistant strains were isolated in 10% of patients. In certain instances, administration of mupirocin may be combined with administration of oral antibiotics to prevent recurrences and resistance.

Mupirocin decolonization may also be an option in the setting of a MRSA outbreak, after consultation with NEPMU or infectious disease experts. For sporadic cases of MRSA in units

where close contact occurs (e.g., recruit settings, ships, academic students) consider screening individuals who have significant daily exposure and/or physical contact with index cases for nasal colonization (per methodology described above). NOTE: Decolonization of asymptomatic carriers (see regimen in Table 3) has been of unproven benefit in controlling MRSA outbreaks in civilian settings and should therefore only be considered on a case-by-case basis.[3,29]

Table 3: Regimen for decolonization

Mupirocin

- Apply approximately one-half of 2% calcium mupirocin ointment from the 1 gm single-use tube (Bactroban®) into one nostril and the other half of the ointment to the other nostril.
- The individual should press the sides of the nose together and gently massage to spread the ointment throughout the inside of the nostrils.
- Continue twice daily for 10 days, avoiding contact of the medication with eyes.[24]

Chlorhexidine*

- Rinse area thoroughly with water, avoiding excessively hot or cold water.
- Wash gently from the neck down with the minimum amount of Hibiclens® as necessary.
- Rinse thoroughly with warm water.
- Continue once daily for 5 days.

*Hibiclens®, containing 4% chlorhexidine gluconate, is known to be toxic. The manufacturer provides the following precautions when using Hibiclens®: Hypersensitivity reactions may occur, particularly in the genital area. Keep away from face and head, since middle ear contact has led to deafness and permanent eye injury may occur following prolonged contact.

7. INFECTION CONTROL - PRIMARY PREVENTION IN MILITARY UNITS

Containing MRSA infections in a confined setting is difficult, time consuming, and resource-intensive. The vast majority of patients with CA-MRSA infection or colonization have acquired it from an external source rather than *de novo*. Primary infection control measures are therefore helpful in reducing the incidence of CA-MRSA infections. Multidisciplinary preventive measures have been implemented in institutions throughout the country where ongoing CA-MRSA cases are occurring.[3,5,6,13,14] Such measures have included education, hand hygiene, adequate showering, eliminating the sharing of personal items or equipment, proper laundering, cleaning of shared equipment after each use, and keeping wounds clean and covered[5,6,11]. The following primary preventive measures should be implemented to reduce the incidence of CA-MRSA infections within military units that experience close contact between members (ships, recruit facilities, training sites, deployed field units).

A. Education

- Recruits and other personnel should be provided information on the transmission, prevention, treatment, and containment of MRSA infections. Condensed information for recruits and other trainees is outlined in Appendix 4: Methicillin-Resistant *Staphylococcus aureus* (MRSA) Fact Sheet.
- Instructors and other senior staff should receive training on the recognition of wounds that are potentially infected.
- Encourage trainees/recruits and other personnel to report all skin lesions to their supervisors or medical personnel.

B. Hand hygiene program

Adequate hand hygiene is the simplest effective infection control measure for preventing and containing CA-MRSA infections. The following hand-hygiene measures should be implemented:

- Recruits and training staff should be periodically provided education on the importance of hand hygiene and effective hand hygiene techniques.
- All personnel should wash their hands with soap and running water a minimum of 5 times per day, including before meals and after toileting. Hands should be washed for at least 15 seconds. Recruits and trainees that have been instilled with good hand hygiene discipline during training periods will carry this practice on to operational and deployed settings where infectious diseases are often prevalent and can incapacitate troops.
- Commands must ensure availability of adequate soap and water. Liquid soap dispensers at sinks are preferable whenever feasible. If bar soaps are used, they should be placed on a rack that allows adequate drainage.
- Use hand sanitizers for times when running water is not available. Although running water is the best method (particularly if hands are visibly soiled), the use of alcohol-based or triclosan-containing sanitizers is an alternative that can be utilized during field training evolutions.
- The local preventive medicine office, environmental health officer or infection control committee should monitor the implementation of each facility's hand hygiene program.

Other measures for improving hygiene:

- Instructors should require (not merely encourage) adequate daily showering and frequent hand washing as part of recruit/trainee training and discipline. If done before meals and upon exiting and returning from barracks, hand washing will be accomplished a minimum of 5 times per day.
- Universal precautions, as previously defined for the hospital setting, should be adapted for recruit facilities and other trainee sites and incorporated into existing policies and procedures. All recruits should be considered potentially contagious whenever direct contact is anticipated with blood, body fluids (e.g., secretions, excretions, feces, and urine, excluding sweat), non-intact skin, and mucous membranes.
- Single use, disposable gloves should be readily available and used when contact with blood or body fluids is anticipated. Healthcare providers should perform hand hygiene BEFORE and AFTER every patient contact, whether or not gloves were worn.

C. Eliminate environmental sources of transmission

MRSA is susceptible to most routinely used environmental cleaning agents. Sanitation measures are essential for preventing the spread of MRSA infections and include the following:

- Discourage sharing of towels and other personal items such as razors or brushes.[6,11]
- Barracks, berthing areas and head facilities should be cleaned regularly with a 1:10 bleach solution or an EPA-registered detergent disinfectant (see www.epa.gov/oppad001/chemreegindex.htm. Equipment and furniture with torn surfaces that cannot be adequately cleaned should be repaired, covered, or discarded.
- Establish routine schedule of cleaning or laundering of athletic and training equipment (e.g., once weekly but ideally after each use). Helmets, protective gear, and weight

benches should routinely be wiped clean after use with a clean dry towel.

- Countertops, exam tables and other treatable surfaces in outpatient healthcare facilities should be cleaned routinely per local schedule and after any contamination with blood or body fluids. The Centers for Disease Control recommends that surfaces should be cleaned with commercial disinfectant (e.g., quaternary ammonium disinfectant) or diluted bleach (1 tablespoon bleach in 1 quart water).[30]

D. Targeted treatment practices

- All senior medical officers should monitor antibiotic use at their facilities to ensure that antibiotics are being appropriately prescribed. The unnecessary use of broad-spectrum antibiotics should be strictly monitored and curtailed to reduce the development of antibiotic resistance.

E. Screening and surveillance

- All recruits/trainees undergoing intake medical screening and physical examinations should be carefully evaluated for skin infections.
- Commands experiencing recurrent cases of CA-MRSA should institute periodic (e.g., weekly) visual inspection of recruits/trainees to recognize skin infections early.
- Recently hospitalized individuals should be specifically instructed to report any new skin infections or fever so that they can be evaluated for MRSA or other hospital-acquired infections.
- All bacterial cultures should be routinely monitored to readily detect any new MRSA infections.
- Instructors should be advised to refer service members to medical care if they have draining sores or wounds or who report "boils," "insect or spider bites," or "sores." NOTE: recruits with minor skin infections may be reluctant to seek healthcare while completing their training, thus delaying care and intervention.
- Food handlers should be advised on the necessity of reporting all skin infections, no matter how minor. Food handlers should be routinely examined for visible skin infections.

8. INFECTION CONTROL - SECONDARY PREVENTION

A. Containment

Recruits or trainees diagnosed with MRSA infections should be examined by a clinician to determine their risk of contagion to others. Wounds with uncontained drainage, weeping cellulitis, purulent catheter-site infections, non-healing abscesses, draining skin sinuses, infected surgical wounds, multiple furuncles, infected burn sites, and MRSA pneumonia should be considered to have a higher risk of contagion. Wound dressings should be changed by medical personnel in a clinic setting only. Individuals with any MRSA infections should be counseled on the importance of handwashing, good personal hygiene, and keeping the site covered. Any worsening of their infection or development of draining wounds should be reported to their instructors or medical personnel immediately.

B. Infection control measures

Contact precautions are indicated for healthcare providers and instructors who come in direct contact with members with potentially contagious skin or soft tissue MRSA infections. Draining

wounds must be adequately covered to prevent contamination of environmental surfaces. Sanitation measures used for primary prevention of MRSA infections should be strictly enforced.

C. Surveillance

After the diagnosis of any single MRSA infection, surveillance measures should be heightened to detect any additional cases through the following procedures:

- The index case should be interviewed to identify potential sources of infection and close contacts, including recent hospitalizations, berthing and work assignments, sharing of personal hygiene items with other personnel, injection drug use, tattooing, participation in close-contact sports, and exposures to other members with draining wounds or skin infections.
- Identified contacts at potential risk of acquiring MRSA should be examined for signs and symptoms of infection. For sporadic cases occurring in settings at risk for close contact (ships, recruit facilities, training institutions), the index case's close contacts and household members should be evaluated for any possible SSTIs. Screening of these individuals for colonization should also be considered. From the 2003 meta-analysis, 4 studies of patients discharged from the hospital with hospital-acquired (nosocomial) MRSA infections found that household contacts were 14 times more likely to be colonized than the general community.[20] Four additional studies evaluated household contacts of 517 sports team members or daycare contacts of persons known to be colonized with MRSA and found that they were at higher risk of being colonized.[20]
- Commands that experience close contact (shipboard, recruit training and other training schools) should regularly track numbers of MRSA infections.

9. OUTBREAK MANAGEMENT

Detection of two or more cases of epidemiologically-related MRSA infections should prompt an investigation to determine if an outbreak has occurred. Outbreak surveillance measures are not indicated if the MRSA infections are obviously unrelated (e.g., two service members returning separately from a hospital where nosocomial MRSA infections are endemic; or multiple MRSA infections separated in time without any epidemiologic linkage). Once a MRSA outbreak is suspected the following measures should be taken:

A. Outbreak investigation

Notify the local military MTF preventive medicine office and the responsible NEPMU. Provide information on the number of cases, the suspected epidemiologic link, the antibiotic sensitivities if known, and antibiotic treatment regimen.

Information about service members with suspected or confirmed MRSA infections should be systematically collected. Include the individual's name, SSN, date the culture was collected, and the patient's berthing, department, platoon, company, or work center as applicable.

MRSA isolates should be further evaluated for antibiotic susceptibilities. The evaluating laboratory should be instructed to save any cultures that are positive for MRSA for at least 30 days. A MRSA outbreak is suggested if similar antibiotic susceptibility patterns are identified among two or more MRSA isolates from epidemiologically-linked patients. Further confirmation of a MRSA outbreak through genetic analysis of MRSA isolates (e.g., pulsed-field gel electrophoresis) should be considered in consultation with local preventive medicine assets and the responsible NEPMU.

B. Infection control measures

Hand hygiene and the use of contact precautions should be strictly enforced for all recruits, trainees, and healthcare providers during a MRSA outbreak. The broader use of an antimicrobial soap in affected berthing, homes, dormitories, or throughout a unit or facility should be considered on a case-by-case basis in the context of a MRSA outbreak.

Focal areas (berthing or platoon) that have been heavily affected with MRSA cases (i.e., more than 5% of members infected) should receive additional training on the transmission of MRSA, wound care, and personal hygiene. Further, the use of a prescription antiseptic wash (e.g., Hibiclens®) for all members of the heavily affected group (both those infected and asymptomatic) should be considered on a case-by-case basis. Instructors of recruits and other trainees should also enforce hygiene measures with all members of this group including observed showers. Unit corpsmen should conduct frequent (e.g., weekly) visual body exams of recruits or trainees from heavily affected units to identify skin lesions early. If the outbreak is confined to or concentrated within a certain berthing or dormitory, all living, sleeping, and bathroom areas should be carefully inspected to identify potential sources of infection.

NOTE: Environmental surveillance cultures (i.e., swabbing training equipment, clinical areas or living areas) to detect MRSA are normally of limited benefit in controlling a MRSA outbreak and should only be considered in consultation with public health authorities with expertise in outbreak control.

C. Decolonization of asymptomatic carriers

Nasal swab surveillance cultures for MRSA and decolonization of asymptomatic carriers with mupirocin are NOT routinely recommended in the context of a MRSA outbreak. Decolonization of asymptomatic carriers (see regimen in Table 3) has been of unproven benefit in controlling MRSA outbreaks in civilian settings and should therefore be considered on a case-by-case basis.[3,29]

In certain confined settings (inpatient wards, within households, or shipboard settings) when a limited number of close contacts can be defined and monitored, MRSA decolonization of asymptomatic close contacts, healthcare workers, and patients may be of benefit. However, the efficacy and permanence of this regimen is of limited benefit for long-term eradication since treatment failure, recolonization and antibiotic resistance are not uncommon. Therefore, decolonization of asymptomatic carriers should be considered only after consultation with public health authorities.

D. Education

Educational efforts should target recruits, trainees, instructors, and medical personnel in order to contain a MRSA outbreak. The following educational initiatives should be considered:

Meetings with service members to reinforce the importance of:

- Regular hand washing
- Good personal hygiene
- Routine showering
- Self-reporting of all skin lesions

Training for instructional staff should reinforce the importance of:

- Regular hand washing
- The routine inspection of berthing areas and head facilities for cleanliness
- The availability of soap
- The examination of recruits for visible skin infections

10. INPATIENT FACILITIES

Inpatient facilities should develop site-specific infection control practices to prevent the spread of resistant organisms.

A. Primary prevention

The following primary prevention infection control measures should be considered for inpatient areas:

- Educational efforts targeting inpatient healthcare providers on the importance of preventing the spread of antibiotic-resistant organisms and the efficacy of control measures.
- Strict enforcement of hand hygiene before and after all patient contacts.
- Avoidance of inappropriate or excessive antibiotic usage for inpatients (monitor through infection control and pharmacy and therapeutics committees).
- Dedication of ward medical equipment to a single patient when contact or droplet precautions are indicated. If use of common equipment or items is unavoidable, items must be adequately cleaned and disinfected before use with other patients.
- Strict enforcement of environmental disinfection of patient rooms, including terminal cleaning at the time of patient discharge. Environmental surfaces that involve more frequent hand contact, such as bed rails and doorknobs, should be targeted for more intensive cleaning efforts.
- Regular monitoring of bacterial cultures of inpatients and recently discharged inpatients to detect clusters of MRSA infections that warrant further investigation.
- Appropriate bed assignments should be made for new admissions that arrive with undiagnosed, potentially infectious conditions, including MRSA, to avoid spread to patients who may be immunocompromised.

B. Secondary prevention

The following secondary prevention infection control measures should be considered for containing MRSA infections in inpatient areas:

- Inpatients with suspected or confirmed MRSA infections should be aggressively evaluated, contained, and treated, since these patients are at greater risk of serious disease. Furthermore, the transmission of MRSA infections to others within the inpatient setting can occur easily and can cause serious illness to other immunocompromised patients.
- Contact precautions and other recommended infection control practices should be strictly enforced.
- Heightened surveillance of other inpatients may be a beneficial infection control measure for certain inpatient units.

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GLOSSARY

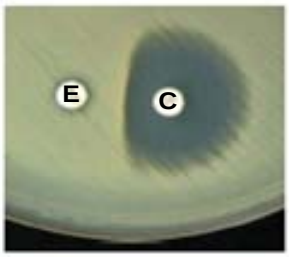
Staphylococcus aureus is a commonly occurring bacterium that is carried on the skin and in the nose of healthy persons. *Staphylococcus aureus* may cause minor skin or soft tissue infections such as boils, as well as more serious infections such as wound infections, abscesses, pneumonia, and sepsis.

Methicillin-resistant *Staphylococcus aureus* or "MRSA" are staphylococcal bacteria that have become resistant to beta-lactam antibiotics, including: penicillin, ampicillin, amoxicillin, methicillin, oxacillin, dicloxacillin, cephalosporins, carbapenems (e.g., imipenem), and the monobactams (e.g., aztreonam). MRSA causes the same variety of infections as staphylococcal strains that are sensitive to beta-lactam antibiotics.

Colonization is the presence of bacteria on or in the body without causing infection.

Community-acquired MRSA infections develop outside a hospital or nursing home setting and may or may not be associated with a healthcare setting, e.g., recent hospitalization.

D test, more formally known as the double disk diffusion test, is a microbiologic assessment for inducible antibiotic resistance using routine antimicrobial susceptibility testing methods. Specifically, it can be used for determining whether inducible clindamycin resistance is present in *S. aureus* strains that initially test erythromycin-resistant, clindamycin-sensitive. Standard antibiotic diffusion disks impregnated with erythromycin and clindamycin are placed in proximity to each other. After incubation, flattening of the zone in the area between the disks where both disks have diffused indicates inducible clindamycin resistance. For more information on the CDC methodology see: http://www.phppo.cdc.gov/nltn/pdf/2004/2_Hindler_D-Test.pdf.



Primary prevention is the implementation of screening, infection control, treatment, and administrative measures aimed at reducing the incidence of MRSA infections in a defined population (such as a recruit training facility).

Secondary prevention is the implementation of augmented screening, infection control, treatment, and administrative measures aimed at preventing further MRSA infections after the initial detection of a MRSA infection within a population. This is typically instituted when transmission of MRSA is suspected to be occurring between members due to close contact such as that might be encountered during recruit training, or in a shipboard or deployed setting.

A **MRSA outbreak** is a clustering of two or more epidemiologically-related, culture-positive cases of MRSA infection. Confirmation that a MRSA outbreak is caused by the same organism is suggested by similar isolate antibiotic susceptibilities and further supported if molecular analysis, such as pulsed-field gel electrophoresis, identifies an identical or predominant MRSA strain.

Universal Precautions are infection control practices used in the healthcare setting to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection.

- Universal precautions apply to: blood; all body fluids, secretions, and excretions (except

sweat), regardless of whether or not they contain visible blood; non-intact skin; and mucous membranes.

- Universal precautions include:
  - Adequate hand hygiene measures in accordance with CDC guidelines after touching blood, body fluids, secretions, excretions (includes wound drainage), and contaminated items, whether or not gloves are worn.
  - The routine use of personal protective equipment such as gloves, masks, gowns, eye protection or face shields and whenever contact with blood, body fluids, secretions, excretions (includes wound drainage) is anticipated.
  - Ensuring that environmental surfaces in the healthcare setting are routinely cleaned and disinfected.
  - Ensuring that linens are handled and cleaned in a manner that prevents staff exposures to contaminated laundry and avoids the transfer of microorganisms from person to person or from place to place.
  - The safe disposal of needles and other sharp instruments and devices in appropriate leak-proof and puncture-resistant containers.
  - The placement of patients who may contaminate the environment or cannot be expected to maintain adequate hygiene or a sanitary environment in a private room.

Transmission-based precautions are patient-specific precautions that are indicated for patients with suspected or diagnosed infections that are either highly transmissible or epidemiologically important. The three types of transmission-based precautions include airborne, droplet, and contact precautions. Contact precautions apply to draining MRSA skin and soft tissue infections; droplet precautions apply to MRSA pneumonia.

Contact precautions include universal precautions as well as the following additional measures:

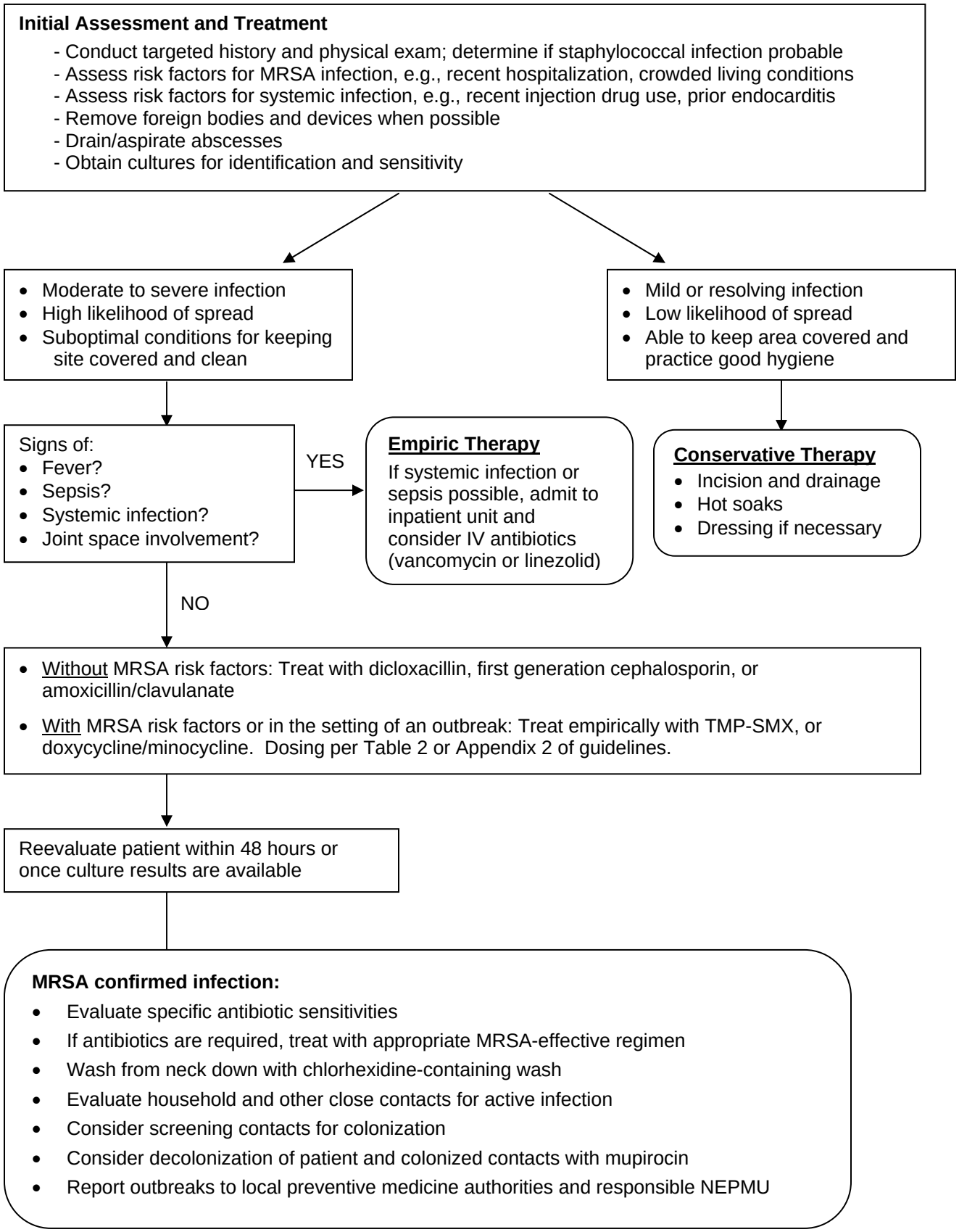
- The patient should be placed in a private room. Patients with the same infection can be cohorted together if private rooms are not available.
- Clean, non-sterile gloves should be worn when entering the room. Gloves should be changed when grossly contaminated with potentially infectious material such as fecal material and wound drainage. Gloves must be removed and hands cleaned immediately (e.g., by washing with an antimicrobial agent or use of a waterless antiseptic agent) before leaving the patient's room taking care not to touch potentially contaminated environmental surfaces or items once hands have been cleaned.
- A clean, non-sterile gown should be worn when entering the patient's room whenever direct patient contact or contact with environmental surfaces or items in the room is anticipated. The gown should be removed before leaving the patient's room, taking care not to have one's clothing contact potentially contaminated environmental surfaces.
- The patient should only leave the room for essential purposes. If the patient does leave their room, precautions should be taken to minimize the risk of transmission of microorganisms to other persons and to avoid contamination of environmental surface or items.
- Noncritical patient-care equipment should be dedicated to a single patient. Common medical equipment that must be shared between patients must be adequately cleaned and disinfected prior to use with another patient.

- No special requirements are indicated for eating utensils. The use of detergent and washing procedures for decontamination are sufficient.

Droplet precautions include routine standard precautions as well as the following additional measures:

- The patient should be placed in a private room. NOTE: The room does not require negative pressure or a special air handling system. The door of the room may be opened without concern that the infectious agent will be transmitted to others. Patients with the same infection may be cohorted together if private rooms are not available.
- A mask, eye protection, or a face shield should be worn to protect mucous membranes of the eyes, nose, and mouth during procedures and patient-care activities that are likely to generate splashes or sprays. Masks should be worn when entering the room or when within 3 feet of the patient. An N95 respirator is not required.
- The patient should only leave the room for essential purposes. If the patient does leave their room, precautions should be taken to minimize the risk of transmission of pathogens by large-droplet particles by wearing a surgical mask.

Appendix 1: Evaluation and Treatment of Skin and Soft Tissue Infections in the Military Setting



Appendix 2: Oral Antibiotic Treatment Options for Skin and Soft Tissue CA-MRSA Infections

Drug	Oral Dose	Monitoring	Drug Interactions/Effects	Comments
TMP-SMX	1 DS tablet BID	Routine lab tests are not indicated	Drug interactions: dapsone, anticoagulants, phenytoin, cyclosporine, diuretics, MTX	Contraindicated in patients with sulfa allergy; maintain hydration with renal insufficiency to prevent crystalluria.
Doxycycline (Minocycline)	100 mg BID	Routine lab tests are not indicated	Adverse effects: rash, erythema multiforme, Stevens-Johnson syndrome, interstitial nephritis, nausea, CNS symptoms	Maintain hydration with renal insufficiency.
Clindamycin	150 mg QID	Routine lab tests are not indicated	Adverse effects: GI upset and relatively high incidence of *C. difficile* pseudomembranous colitis compared to other antibiotics.	If isolate is erythromycin resistant *in vitro*, clindamycin resistance may develop during tx: Confirm with micro-biology lab prior to use that D test is negative.

- Select antibiotics based on local patterns of susceptibility (i.e., use local MTF antibiograms) and antimicrobial sensitivities. Consider administration of medications by directly observed therapy.
- Rifampin as monotherapy is always ineffective against CA-MRSA due to the rapid development of resistance, regardless of *in vitro* laboratory susceptibility results. Rifampin is useful as adjunctive therapy, but does have the potential for significant toxicity and drug interactions that preclude its recommendation for all cases. Adverse effects include rash, erythema multiforme, Stevens-Johnson syndrome, hemolysis with G6PD deficiency, hepatitis, pancreatitis, and bone marrow suppression.
- Resistance to fluoroquinolones and clindamycin is increasing. Use fluoroquinolones only when organisms have laboratory-proven sensitivity and never as monotherapy. Use clindamycin only after confirmation of sensitivity by D test. See Glossary for more detail on D testing.
- Recurrent/persistent skin lesions may indicate non-adherence to treatment, antibiotic resistance, or reexposure to an infected source.
- Resistant or serious infections usually require IV vancomycin.

NOTE: In the context of a MRSA outbreak or in patients with recurrent infections (i.e., 3 or more documented MRSA infections within 6 months), consider decolonization with: (1) mupirocin 2% ointment applied topically to the nares twice daily for 10 days and (2) body wash from the neck down with a chlorhexidine-containing wash such as Hibiclens® for 5 days.

Appendix 3: Treatment Options for Hospital-Acquired or Serious MRSA Infections

Drug	Dose*	Monitoring	Drug Interactions/Effects	Comments
Vancomycin (Vancocin®)	1,000 mg IV q 12 hrs Infuse over 1 hour Note: not effective if given orally	Monitor trough drug levels within 1 hr of next dose: target is 10-15 mcg/mL Auditory function Renal function CBC	Adverse effects: ototoxicity, nephrotoxicity, drug fever, hypotension, rash, pruritis, reversible neutropenia. When used with: • Aminoglycosides - ↑ nephro-toxicity • Anesthetics- histamine reaction, flushing	Infuse over 1 hour to reduce the onset of "red man syndrome"- flushing, hypotension. Monitor BP Adjust dosage based on trough levels May require 2nd or 3rd antibiotic for serious infections
Linezolid** (Zyvox®)	600 mg BID oral or IV Can take with or without meals	CBC with diff/platelet count weekly Monitor BP – if hypertensive or taking a sympathomimetic	Adverse effects: Diarrhea, bone marrow suppression, nausea, headache Avoid consuming foods containing large amounts of tyramine***	Use cautiously if patient is hypertensive Avoid adrenergic and serotonergic agents, including decongestants
Daptomycin** (Cubicin®)	4mg/kg IV q 24 hrs	CPK weekly Monitor for myopathy and neuropathy	Adverse effects: myopathy, neuropathy, nausea, headache, diarrhea, constipation, possible *C. difficile*	Renally adjust dose for patients with Ccr < 30 ml/min Consider holding other medications associated with rhabdomyolysis (e.g., statins)

* Sepsis requires at least 2 weeks of IV antibiotics. Endovascular infections such as endocarditis, osteomyelitis, and other deep-seated infections require 4-6 weeks of therapy and may require combination antibiotic therapy. Consult with expert on treatment regimen and duration.

** Linezolid and daptomycin are new antibiotics with limited efficacy and toxicity data. Prescribe only in consultation with a physician expert.

*** Avoid foods with very high tyramine content such as packaged soups, pickled/smoked fish, orange pulp, fava beans, and aged cheeses.

NOTE: In the context of a MRSA outbreak or in patients with recurrent infections (i.e., 3 or more documented MRSA infections within 6 months), consider decolonization with: (1) mupirocin 2% ointment applied topically to the nares twice daily for 10 days and (2) body wash from the neck down with a chlorhexidine-containing wash such as Hibiclens® for 5 days.